

## A NEW HOST RECORD FOR FORCIPOMYIA CRINITA SAUNDERS<sup>1</sup>

(Diptera: Ceratopogonidae)

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Almost 50 species of biting midges from the family Ceratopogonidae are recorded as sucking haemolymph from butterflies and moths (both adults and caterpillars), lacewings, meloid beetles, alderflies, walking sticks, dragonflies and damselflies, sawfly larvae, crane flies, mosquitoes, and even a phalangid or daddy-long legs. These are in the genera *Atrichopogon*, *Forcipomyia* and *Pterobosca*. One species of *Culicoides* sucks blood from mosquitoes, but this seems to be an indirect method of obtaining its usual blood meal. (Wirth, 1956).

Most reports indicate that the host insect is not particularly bothered by the feeding activities of these tiny ectoparasites. The hosts continue their feeding or mating and other activities undisturbed even though half a dozen or more midges may be sucking their blood. However, Korschefsky (1937) recorded an *Atrichopogon* attacking a blister beetle and indicated that the beetle was very disturbed by the biting of the gnats and rubbed its sides vigorously, trying unsuccessfully to rid itself of these pests.

The site of biting or insertion of the beak is variable. These biting midges have been taken on the veins of the wings of their hosts, on other parts of wings and even tunneling through the

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scales on a butterfly wing; they've been taken on the head, thorax, and abdomen, and on both lightly and heavily sclerotized areas as well as membranous parts.

Several authors have mentioned that the insects were actually observed imbibing haemolymph because they could see the abdomen enlarging as it filled with the host's blood. We do not know of anyone actually analyzing the abdominal contents of one of these engorged midges, however. *Culicoides* are well-known blood-suckers of warm blooded animals and even frogs, so it is not surprising that their more primitive relatives would take blood from other arthropods.

These insects have evolved several modifications in their mouthparts and legs that apparently assist them in their parasitic habits. In some the claws are enlarged and strongly curved thus increasing their holding ability. In others the claws are bifid at the tip and in most the empodium is strongly developed with a pectinate form. The mouthparts are especially well-developed for piercing the exoskeleton of their hosts. The mandibles and maxillae are armed with minute teeth from 6-15 or more in number. These make effective cutting instruments. The shape of the mandibles may show a correlation with the degree of hardness of the cuticle of the host, but not enough is known of the feeding habits of the described species to draw firm conclusions. Some mandibles taper to a broad rounded tip with teeth all around the distal margin, others have a narrow rounded tip with teeth, others are narrow their entire length, some end in a sharp point, and a few are relatively narrow and then expanded or broadened at the tip.

In a recent paper Wirth and Messersmith (1971) have described a new species of *Forcipomyia* in which the maxillae bend outward distally perhaps to help hold the mouthparts in place during feeding. The host of this species is unknown.

These ectoparasitic insects have been collected from all parts of the world from over 125 different host species. In only one reported case, which was from Cuba, was there an implication of potential biological control from the activity of these little pests. In this example Baker in 1907 reported that 1 to 6 midges of the species *F. fuliginosa* perched on a larva of a moth and remained until they sucked it dry and killed it. It is conceivable that some of

these little parasites could be an effective control agent if they were abundant enough. However, so little is known of their biology at the present time and so few have been collected that the chance of their ever assuming any economic importance is rather remote.

*Forcipomyia crinita* Saunders has previously been recorded as an intermittent parasite on four beetle hosts. These are three cerambycids: a Rustic Borer (*Xylotrechus undulatus*), the White-spotted Sawyer (*Monochamus scutellatus*), and the Northeastern Sawyer (*Monochamus notatus*), and one curculionid: a Leaf-rolling Weevil (*Attelabus bipustalatus*) (Soper and Olson, 1963). Previous accounts gave taxonomy and distribution with little mention of behavior. In our account some aspects on the behavior of this fly towards two previously unreported hosts, the Soldier Beetle (*Chauliognathus pennsylvanicus*) (Cantharidae) and the Black Blister Beetle (*Epicauta pennsylvanica*) (Meloidae) are described.

These observations were made at two seepage areas in the Blue Ridge Mountains of Warren County, Virginia. The two sites are about one kilometer apart but are in the same stream valley. The lower site, at 200 meters elevation, is at the north base of an earth-fill dam. The upper site, at 260 meters elevation, is on the northeast shore of a small lake. Both are overgrown with young trees, grasses and herbaceous plants, especially Goldenrods (*Solidago* sp.) and White Boneset (*Eupatorium perfoliatum*). Both are between deciduous forest and water, and both have saturated soils covered with mosses and algae. These areas were examined on the 22nd, 23rd, and 30th of August and the 9th of September. During this period the weather was fairly uniform, with temperatures in the mid 80's, humidity from 30 - 50% and sunny skies.

A total of 93 flies were observed on 58 beetles, of which 56 were the cantharid. The beetles supported from one to eight flies each, with one fly per beetle being both the mode and the median. The percentage of the total beetle population that was infested varied on different days and at the different sites. At the lower site, which was considerably smaller, the cantharid population had a peak of about 20 individuals on the 30th, of which 30% were parasitized. The population peak at the upper site was about 350 individuals on the same day and only about 7% were parasitized. Unlike the beetles, the fly population did not change much over this three week period.

The flies exclusively attacked the dorsal surface of the beetles. Although this area is probably harder than the ventral surface it is easier to land on and easier to remain on, with active hosts such as these beetles. The pronotum was the most commonly attacked spot relative to its size, but this was not a statistically significant preference. Other sites were the epicranium, the elytra, and the membranes and spaces between these areas.

The flies seemed to prefer male cantharids, especially males of mating pairs. In virtually all mating cantharids observed, the male was being bitten while the female wasn't. It is not known whether this is due to some attractive quality of the male or simply to the male's greater exposure to being bitten while mating. However, of nine single parasitized cantharids that were collected and sexed later, eight were males.

Upon approaching a beetle, a fly typically hovered about it from 2 to 4 centimeters away for several seconds, often accompanied by other flies. Landing was quick and the fly normally remained stationary at the first touch-down point. The presence of another already feeding did not seem to deter any fly, although there was usually only one fly to a host. Feeding began immediately and lasted for an average (mean) of 9 minutes and 46 seconds in 11 timed observations. However, although the time spent attached ranged from 2 seconds to 46 minutes 30 seconds, it was not observed to be sufficient for any fly to become fully engorged. This is because the fly's visit, in 18 out of 19 cases, was terminated by the beetle taking flight during the course of its normal activities and not by the completion of the fly's blood meal. Additional evidence of this is that many flies were observed to land with some blood in them, but not fully engorged. During the beetle's flight, all of its flies were usually dislodged, but in 3 instances flies on the pronotum survived the flight. This observation could explain the higher than expected number of flies found on the pronotum.

In general, the beetles appeared oblivious to the presence of the flies and continued crawling and flying around, and feeding and mating in their normally active manner. In at least 2 cases, however, (one a single individual, another a mating male) previously normally active individuals became extraordinarily active soon after being attacked and moved about rapidly until losing the flies

by flying to an adjacent plant. The beetles then resumed their previous activity at their previous pace.

The flies in this area were remarkably specific in their choice of hosts and host plants. They did not attack cantharids on flowers other than Goldenrod and White Boneset and did not attack other insects located on these flowers, including members of the families Acrididae, Gryllidae, Tettigoniidae, Mantidae, Miridae, Phymatidae, Cicadellidae, Chrysopidae, Otitidae, Asilidae, Scarabaeidae, Mordellidae, Cerambycidae, Vespidae, and Apidae. Although the meloid was as common as the cantharid, it too was generally ignored. Both instances of parasitism occurred in the lower area, where the fly/host ratio was considerably higher than the upper area.

In summary, *Forcipomyia crinita* is an intermittent parasite of beetles. When feeding on cantharids, it seems to prefer the male, normally does not obtain a full blood meal on its first attempt, and normally does not disturb its host. The population studied displayed a high degree of specificity as to its host insects and plants.

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#### A NEW HOST RECORD FOR *FORCIPOMYIA CRINITA*

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**ABSTRACT** - *Forcipomyia crinita* is a known intermittent ectoparasite of beetles. It is here reported feeding on *Chauliognathus pennsylvanicus* (Cantharidae) and *Epicauta pennsylvanica* (Meloidae). When feeding on the cantharids, it seemed to prefer the males. It normally did not obtain a full blood meal on its first feeding attempt, and usually did not disturb its host. Bystrak, Paul G. and D. H. Messersmith, Department of Entomology, University of Maryland, College Park, Maryland 20742.

Descriptors: *F. crinita* (Ceratopogonidae) on beetles.